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# Incorporation of the Vygotskian Approach into physical skills acquisition

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**Abstract**

This article concerns the use of symbolic tools by junior school aged athletes in the motor skill's development. The study involved 42 young soccer players (aged 9–10), attending a soccer sport school in Moscow, Russia. Trying to incorporate the Vygotskian approach into practical sports problems' solution, the authors used specifically designed mini-movies, which were short video clips employing different symbolic tools (schematic representation and metaphor) for mastering specific soccer skills. The results showed that symbolic tools for learning motor skills can be effective in working with young athletes regardless of their age.



Keywords: Sport psychology; Motor skill; Symbolic tools; Schematic representation; Metaphor

## 1. Introduction

Vygotsky [1], [2] claimed that the acquisition of higher mental functions occurs due to an acquisition of sign. The development of practical (physical) skills also "stands in direct connection with sign acquisition" [2]. According to Vygotsky, most skills are perceived within the situation in which they occur [3]. Such unity prevents the subject from acquiring the skill. Therefore to make the skill more flexible (not dependent from the situation in which it is fulfilled) we decided to address Vygotsky's idea of sign implementation during the course of acquiring the physical skill.

A number of works devoted to the development of motor skills demonstrate the effectiveness of using symbolic tools [4], [5], [6] . It was shown that symbolic tools can be differentiated according to the degree of correspondence to the situation in which they are used: sign is directly connected with the meaning in the frame of the situation in which it is used, whereas content of the metaphor differs dramatically from the content of the

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situation [7]. In the literature the age at which individuals acquire metaphors and can manipulate them freely is extensively discussed [8]. The research shows that already at preschool age children can understand metaphors.

Since Vygotsky thought that using a sign extracts any skill or operation out of the situation in which it occurs and as such makes the skill more conscious and intended (that is especially important at early stages of physical skill acquisition), we expect the implementation of symbolic tools to be effective as an intervention method for mastering physical skills. In other words, we suggest that specifically designed intervention will provided a mediate nature to master the physical skill, keeping the key idea of the movement and at the same time bursting its unity with the perception of a situation.

It should be mentioned that results of our previous research showed the effectiveness of using symbolic tools when working with pre-school aged athletes [9], [10]. Therefore, as for the present work, we hypothesized that symbolic tools will be also an effective technique for developing specific soccer skill in junior school aged athletes.

## 2. Methods

*2.1 Participants.* The participants were young athletes, aged 9–10 years (N = 20, M = 9.6 years), attending Chertanovo soccer school. At the time the experiment was conducting all participants had at least 2 years' experience in soccer training. The experiment was carried out in compliance with Code of Ethics of the Russian Psychological Society.

At the beginning of the experiment all the young soccer players were given the figural form of the Torrance Tests of Creative Thinking (TTCT) as the most appropriate measure of the initial level of athletes' imagination [11]. Based on the results of the test and their general physical ability children were evenly assigned to the two groups (schematic representation-group and metaphors-group).

*2.2 Performance Rates.* The central motor skill to be developed was lobbed pass directed to the partner's feet. The choice of motor skill as an object of research was determined by the recommendations received from consultations with the coaches; the choice takes into account both the age characteristics of this group of athletes and their physical ability. Monitoring the success of the training in developing players' motor skills was conducted by controlling changes in the individual indicators of lobbed pass. Monitoring was carried out by making videos of the athletes' motor skill performance. Assessment indicators that reflect the constituent elements of the movement were following: technique of the initial kick, height of the kick, and accuracy of the kick during the performance of lobbed pass.

*2.3 Symbolic Tools.* Intervention design involved the use of specifically developed mini-movies: for schematic representation-group of athletes and metaphors-group of athletes. Both video clips also had identical starting and ending camera shots, which showed a coach performing the movement; the difference was situated in central fragments of the mini-movies. In the schematic representation-movie, drawing animation of a human performing the skill was used to show key elements of lobbed pass's performance (see Fig. 1a). In the metaphors clip, in the form of an animated cartoon, a symbolic image of the movement was presented (see Fig. 1b). The metaphor was presented by image of an archer shooting at a target. The released arrow (the ball) flies from the archer to the target center (symbolizing the ball getting to the partner's feet) in an arc-like trajectory (similar to the lobbed character of the pass) through a horse caracoling between the archer and the target (to stress the necessity to make a "lobbed" shot).

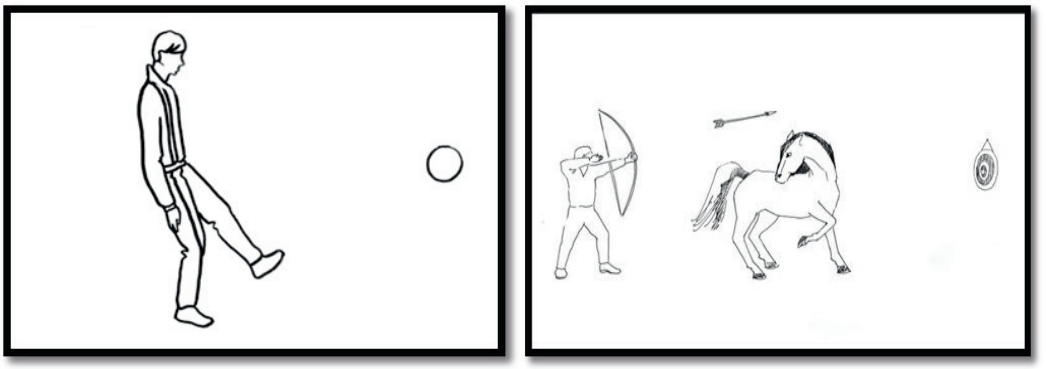

Fig.1. (a) A scene from the mini-movie for the sign-tools group; (b) A scene from the mini-movie for the metaphors group

*2.4 Procedure.* The preliminary stage of the experiment was devoted to analyzing the athletes' abilities, specifying the motor skill that would be the object of analysis, and subsequently shooting the training mini-movies. The intervention part of the experiment included 6 individual sessions with the athletes. At each third meeting, each athlete's mastery of the skills was monitored by video. In addition, before and after the main stage of the experimental intervention two extra monitoring videos were made (pre- and retention tests). The whole procedure for implementing the intervention was similar for both groups of participants. The main difference in the training of the two groups of players consisted in using either schematic representation or metaphor to develop certain soccer skill. In the course of the research, all athletes continued their usual physical exercises in the same way as before the intervention.

## 3. Results and Discussion

The monitoring data were assessed by expert analysis of indicators that reflected the constituent elements of the lobbed pass (technique of the initial kick, height of the kick, and accuracy of the kick). Results of disperse analysis revealed that there was a consistency of experts' opinions on the issue of the success of mastering the motor skills ($p>0.05$). Application of the Kolmogorov-Smirnov test showed normality of all distributions, therefore, parametric statistics was used for further data analyses.

The paired-samples t-test was used for the assessment of the effectiveness of symbolic tools' implementation within relevant group. For the metaphors-group, significant differences were indicated against the following parameters: technique of the initial kick ($p=0.042$) and accuracy of the kick ($p=0.022$); whereas for the schematic representation-group, significant shift was showed only on the indicator of accuracy of the kick ($p=0.024$). A possible explanation may be that the content of the mini-movie for this group focused more attention on the schematic image of the accuracy of the kick (the image of the released arrow flies from the archer exactly to the target) than on the other movement's parameters. Thus, generally, by the time intervention was completed both schematic representation and metaphors-group athletes clearly had improved their performance of chosen motor skill (lobbed pass).

Checking the assumption that one of the symbolic tools would be more effective then another, we turned to the further analysis of the obtained data so that significant differences between groups on the chosen indicators could be defined. As a result of implementation of the independent-samples t-test, statistically accurate differences (for the data received after the intervention had been completed) in indicators of technique of the initial kick ($p=0.035$) and accuracy of the kick ($p=0.032$) were shown between the studied groups for the benefit of metaphors-group athletes.

It is interesting to note that these results are not in compliance with what Gardner et al. [12] have found in their research. They believe that preschool-age children are sensitive to the use of metaphor, but at school age this sensitivity is greatly reduced, and it appears again in adolescence. This pattern may have several

explanations. If we consider metaphor not only as an instrument of the content structuring based on analogy but also as having a marked emotional component, it is obvious that for a spontaneous "use" of metaphor in different age groups the conditions are not equal. As we have observed previously [9], given the transition from motivational images in younger age groups to cognitive images in more mature groups, we should expect differences in metaphor usage between children and adults not only according to the logical structure of metaphors (as proposed by Gentner [13]) but also according to the degree of symbolism. Nevertheless, as we have seen, results of this experiment proved that school aged children not only were able to perceived metaphor but also could use it as an effective tool for developing physical skills.

The results of correlation analyses among Torrance' indicators of figurative visual thinking and parameters of the constituent movement's elements reveal certain correlation tends between them. The nature of obtained relationships depends on the studied group: for the metaphors-group, the accuracy of the kick showed positive correlations with flexibility (r=0.67) and originality (r=0.64) of thinking, and the height of the kick showed another positive correlation with elaboration of thinking; whereas for the schematic representation-group, negative correlations were found between "the accuracy" and flexibility (r= -0.67) and fluency (r= -0.4) of thinking, while fluency was also negatively correlated with the technique of the initial kick (r= -0.65).

Thus, correlation analyses shows that there is a connection between the athletes' initial visual thinking ability and their future success in physical skills acquisition depending on the type of symbolic tools used. In other words, specific nature of revealed correlations within the groups show that behind the enhanced parameters of physical skill acquisition there are different processes of mastering such symbolic tools as a schematic representation and a metaphor. While metaphor usage requires subsequent level of visual thinking development, schematic representation usage demands different capacities. Moreover, results demonstrate that athletes with advanced visual thinking ability are not only more likely to benefit from metaphor usage, but apparently they will not benefit through schematic representation-based learning.

## 4. Conclusion

The present study proved that symbolic tools for learning motor skills can be effective in working with young athletes of junior school age. Namely, the results reveal that young athletes, aged 9–10 years, can benefit from using a metaphor as well as a schematic representation. At the same time, those athletes who used a metaphor as an additional tool to master motor skills seemed to be more successful in the development of the lobbed pass than did the athletes who used schematic representation.

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